

A MODIFICATION OF THE GRITTI AMPUTATION WITH SPECIAL REFERENCE TO NERVE BLOCK- ING AND REGIONAL ANÆSTHESIA.

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RECENT advances in surgical physiology have placed on a firm foundation the necessity of nerve-blocking during amputations that may be accompanied by shock. In numerous publications various authors have conclusively shown that if the nerve impulses are so blocked that the additional depressing influences produced by the amputation are prevented from reaching the medullary centres, amputations and other operations can be done with no effect whatever on the blood-pressure, providing there is not much hemorrhage.

Several years ago the author published a large number of animal experiments in which it was conclusively demonstrated that such an effect could easily be obtained by spinal anæsthesia. If an anæsthetic such as stovaine is injected into the spinal cord so as to produce a complete anæsthesia, the lower parts of the body are practically entirely cut off from the vital centres. Trauma produced on these parts has no more effect in causing shock than if this trauma was made on another individual. Since this publication we have carried our own work a step further and found that the same result can be obtained if the principal nerves in the limb are injected with stovaine. This procedure thoroughly carried out has an efficient effect in preventing shock and also eliminates the small danger which is present with spinal anæsthesia.

The Gritti amputation admits of such a simple method of applying nerve-blocking or regional anæsthesia that we believe the technic which has been adopted for this purpose will be of interest. First of all it is understood that the term "Gritti Amputation" applies to all amputations at the knee in which the patella is attached to the sawed end of the femur. By

this method amputation can easily be performed with practically no pain and without general anæsthesia. However, if the patient's condition warrants it we generally use ether also, in order to eliminate the psychic influences that are present during an operation in full consciousness.

Technic.—After the usual cleansing the skin is infiltrated with stovaine in the upper angle of the popliteal space. A skin incision about two inches long is then made in the upper angle and the external and internal popliteal nerves are easily found in this situation. In order to prevent any pain from the injection of the nerves a few drops of stovaine are applied to the outside of the nerves and after waiting a moment a small hypodermic needle can be thrust into the nerve trunks and enough of the stovaine solution injected to cause a marked swelling of the nerve trunk. This being done to both nerves the incision is then deepened and the popliteal artery identified and ligated in the upper angle of the popliteal space. The vein is not disturbed at this point, as it is important after ligating the artery to elevate the leg for a few moments to allow as much blood as possible to flow back into the general circulation. The stovaine solution used is 2 per cent. or 4 per cent. according to the quantity one expects to use.

The next step is to carry the previous longitudinal skin incision straight down the popliteal space to the level of the tubercle of the tibia. An incision is then carried straight across the front of the leg on a level with the tubercle. If ether is not used, it is necessary to infiltrate this incision. When ether is used this need not be done. The skin flap thus outlined is dissected up for a short distance until the ligamentum patellæ is exposed. The knee-joint is then opened through the ligamentum patellæ, all the capsular structures cut away and the tissues in the popliteal space cut straight across on a level considerably below the point of injection of the nerves and the ligation of the artery. This leaves the head of the femur projecting from the wound. The entire head is sawed off sufficiently high so that the patella will come down over it without any tension. The posterior cartilaginous surface of the patella is then sawed

off, so that a flat bony surface can be applied to the end of the femur.

Satisfactory stumps have been obtained by us through fixing the patella in place by means of heavy chromic stitches passed through the periosteum and available fascia surrounding both bones. However, the pull of the extensor muscles is sometimes considerable, so that it has been found better to re-enforce these fascial stitches with one heavy chromic stitch passed through drill holes in both bones. This having been done the muscles and fascia surrounding the bones are brought snugly together with plain catgut stitches and the skin sewed in such manner that when finished it presents the shape of an inverted "T," the skin suture being on the posterior surface of the leg and some distance above the lower end of the stump.

The advantages of the above plan of operating have been very apparent to us and we believe that with its use a number of cases have been led to a successful recovery who would have died without this plan of operation. We have published a number of the blood-pressure charts taken during these operations which show that they can be performed in this way with practically no effect whatever in regard to shock; furthermore, the possibility of amputating by this plan without ether is of great advantage in certain cases. Two of the cases have been brought to successful recovery by amputating without ether, and in both cases (numbers 7 and 11 below) we feel that the administration of ether alone would have been fatal even though no operation had been done.

Another great advantage which belongs to the Gritti amputation in general is the satisfactory condition of the stump. Every surgeon who does many amputations will recall cases where the patients have complained bitterly of pain in the stump, although the stump itself may be apparently in good physical condition. These conditions are very distressing to both patient and surgeon, and unfortunately a revision of the amputation does not always give relief. In one case of our own after an amputation of the arm, the pain was so great that we were led to cut all the nerves in the brachial plexus, and

even this procedure gave practically no relief. Of the twelve cases in which we have done the Gritti amputation in the last few years we have been able to trace six for periods varying from two months to three years, none of the cases traced have complained of any pain whatever in their stumps.

A third great advantage in this form of amputation lies in the fact that the patient can, if he wishes, use a peg leg. This is of greater importance to working people as artificial legs are expensive and frequently get out of order if used in very active work. Of the cases we have been able to trace, five have been doing active work in the mines with peg legs which are practically less expensive than ordinary shoes. While most of these cases have artificial legs for dress occasions, they nearly all say that they can walk just as well and a few can walk better with their peg legs.

For the above reasons we have come to feel that the Gritti amputation as outlined above is an ideal method and it is now the one which we use in any case around the knee-joint, and we believe it is much preferable to any form of operation which leaves a tibial stump less than six or eight inches long.

ABSTRACT OF CASES.

CASE I.—Leg caught between bumpers of car; gangrene followed and amputation in middle of leg two weeks after accident. Second amputation, Gritti type, on account of sloughing of flap ten days later. Nerves not blocked. On discharge stump healed and in good condition, no pain. Left for Old Country.

CASE II.—Leg amputated about 4 inches below knee for run-over accident when patient was three years old. Came to hospital on account of painful conical stump. Stump of tibia is about 4 inches long and is badly ulcerated over end. Typical Gritti amputation; ether without nerve-blocking. On discharge wound healed and stump in good condition. Examined three years later; is working in mines says that he never has any pain while at work. He uses a peg leg which he bought for \$2.00; has an artificial leg which he uses when dressed up.

CASE III.—Large mass of coal fell on leg, hopelessly crushing bones and soft parts. Immediate typical Gritti amputation;

FIG. 1.



CASE V.—The stump in Gritti's amputation two years after operation.

ether without nerve-blocking. On discharge wound healed, stump in good condition. Seen three years later; stump in good condition. Has no pain at all, working as switch-tender in mines. While working uses a peg leg which another miner made for him; uses an artificial leg for dress occasions.

CASE IV.—Leg crushed between a car and a mine pillar. Crushed portion became gangrenous, presumably from blood clot in one of the large vessels. Eight days after injury typical Gritti amputation. Ether with nerve-blocking. On discharge wound healed, stump in good condition. Examined three years later; has no pain whatever in stump. Has worked regularly as an upholsterer, uses an artificial leg which carries all the weight on the end of the stump.

CASE V.—Leg run over by mine car twelve hours before admission; brought to hospital in bad condition of shock and hemorrhage. Condition on admission very poor, so that patient had to be given intravenous infusion; crushed leg dressed temporarily and patient put to bed to react from primary shock. Twelve hours later patient in fair condition; a typical Gritti amputation performed with nerve-blocking. Pulse rate and blood pressure same at end of operation as at beginning. On discharge wound healed; stump in good condition. Seen two years later, has no pain whatever, doing work in the mines. Uses peg leg while at work, has a patent leg for dress occasions. Plate 1 shows the stump in this case two years after operation. In this case the patella was fixed to the femur with chromic stitches passing through the periosteum and fasciae only.

CASE VI.—Buffalo Branch. Severe crush of leg. Immediate Gritti amputation. In bad condition on admission and died twenty-four hours later from shock and hemorrhage.

CASE VII.—Leg run over by mine car. Admitted to hospital seven hours later in marked shock; pulse 110, temperature 98. Leg dressed temporarily and patient put to bed to await reaction. The following morning condition was considerably improved; Gritti amputation with regional anæsthesia, as outlined in text. Operation was painless and blood pressure readings during operation show practically no change. Wound did well, but patient died three weeks later as the result of other injuries.

CASE VIII.—Crushing injury to leg. Immediate Gritti amputation. Ether with nerve-blocking. Blood pressure before

ether 130, at end of operation 140. Seen eighteen months later, has no pain, working in mines as a pump runner. While working uses a peg leg which cost \$15; has an artificial leg for dress. Says that he can walk much better with the peg leg than the artificial one.

CASE IX.—Buffalo Branch. Crushing injury to leg. Marked shock on admission, intravenous infusion before operation, typical Gritti amputation under ether. Seen eight weeks later; wound healed, patella firm, no pain. Since left for Old Country.

CASE X.—Run over by car four hours before admission. In considerable shock on admission. Operation delayed nine days in hopes of saving leg. Typical Gritti amputation, ether, nerves not blocked. On discharge wound healed, stump in good condition. Left for Old Country.

CASE XI.—Struck in popliteal space by a piece of coal shot from blast. Taken home at first in care of family physician. Popliteal vessels were evidently cut and signs of gangrene appeared at once. Brought to hospital on day following injury; general condition very bad, loud double heart murmurs, large amount of albumin and casts in urine, looks septic, and area of gangrene is extending. Administration of ether impossible. Two days after admission typical Gritti amputation with regional anæsthesia, as outlined in text. Operation painless and without shock. Immediate satisfactory recovery, and later the heart murmurs and urinary condition entirely cleared up.

CASE XII.—Run over by car one hour before admission. On admission general condition good. Immediate Gritti amputation with ether and nerve-blocking; no shock produced by amputation. Seen six months later; no pain; has not procured a satisfactory artificial leg.